

REMARKS

Claims 1-12, 14-23, and 27 are pending in the application. Claims 1-7, 12, 14-21 and 27 are withdrawn from consideration pursuant to a previously imposed restriction requirement and subsequent election of claims 8-11, 13 and 22-26. Accordingly, claims 8-11, 22 and 23 are currently pending for prosecution, with claim 8 being in independent form. Applicant respectfully requests reconsideration in light of the following remarks. No changes to the claims have been presented by way of this Response.

Rejections Under 35 U.S.C. §103(a):

Claims 8-10 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Patent No. 5,328,546 to Brady et al. (hereinafter “Brady”), in view of U.S. Application Publication No. 2003/0133762 to Yamamoto et al. (hereinafter “Yamamoto”). Claims 11, 22 and 23 stand rejected under 35 U.S.C. §103(a) for obviousness over Brady in view of Yamamoto, and in further view of U.S. Patent No. 6,080,263 to Saito et al. (hereinafter “Saito”). These rejections are respectfully traversed.

The present invention relates to a method and apparatus for sticking a tape to a semiconductor wafer to protect circuits formed on the surface of the wafer. More particularly, the invention relates to a method and apparatus capable of preventing the warpage of a thin semiconductor wafer having a circuit imprinted thereon, to which a protective tape has been stuck.

Specifically, pre-cut protective tapes 12 are attached to a long support film 10, and the support film 10 is attached to frame member 18 at positions where the pre-cut protective tape 12, to be stuck to a semiconductor wafer 14, is positioned within the frame member 18. The support film 10 is pressed to stick the pre-cut protective tape 12 to the semiconductor wafer 14, and the support film 10 is released from the tape 12. The long support film 10 is under tension, but this tension is decreased, with respect to the pre-cut, spaced-apart protective tapes 12, when the support film 10 is attached to the frame member 18.

Accordingly, the pre-cut protective tape 12 stuck to the semiconductor wafer has reduced residual stress, and the thin semiconductor wafer, to which the tape 12 has been stuck, is free from warpage, which would otherwise be caused by a protective tape applied under tension.

Additionally, the protective tape 12 is pre-cut to approximately the shape of the semiconductor wafer. Therefore, the pre-cutting prevents the cutter from damaging the outer peripheral edge of the wafer, which is a problem in the prior art.

Independent claim 8 is directed to an apparatus for sticking protective tape to protect circuits formed on a surface of a semiconductor wafer. The apparatus includes a mounting table having an adherend-mounting surface on which the semiconductor wafer is mounted; a frame member surrounding the adherend-mounting surface of the mounting table, the frame member having an interior length and an interior width defining an interior perimeter surrounding the semiconductor wafer; a movable fixing roll for attaching and fixing a long support film to the frame member, the fixing roll having a width greater than the interior width of said frame member such that said fixing roll does not fit within the interior perimeter of said frame member, the support film having a sticky and removable surface to which a pre-cut protective tape is attached, said pre-cut protective tape having a sticky surface, the protective tape being pre-cut to a size approximating a size of the semiconductor wafer and adapted for being stuck to a surface of the semiconductor wafer; and a movable sticking roll for sticking the pre-cut protective tape to the semiconductor wafer, the sticking roll having a width less than the interior width of said frame member such that said sticking roll fits within the interior perimeter of said frame member. The apparatus is constructed such that the support film is arranged above the frame member so that the pre-cut protective tape is included in the frame member; the fixing roll moves to fix the support film to the frame member, whereby the frame member relieves tension on said support film and the pre-cut tape; the sticking roll moves to press the support film and the pre-cut protective tape carried by the frame member to stick the pre-cut protective tape to the semiconductor wafer; and upon further movement of the sticking roll, the support film is released from the pre-cut protective tape, whereby the pre-cut protective tape is stuck to the semiconductor wafer with a reduced residual stress.

Applicant respectfully submits that in order to establish a *prima facie* case of obviousness, three criteria must be met. First, the modification or combination must have some reasonable expectation of success. Second, the prior reference or combined references must teach or suggest all the claim limitations. MPEP §2143. Finally, an apparent reason for one of ordinary skill in the art to combine the prior art teachings to reach the claimed invention should be identified. *KSR Int'l Co. v. Teleflex, Inc.*, 82 USPQ2d 1385 (U.S. 2007). The analysis of an obviousness finding should be made explicit. *Id.*

Brady teaches a photo resist film application mechanism for applying a layer of dry film resist (18) to a semiconductor wafer (72). In particular, Brady discloses a tape transport assembly (44) at one point being positioned over a laminating assembly (71). A semiconductor wafer (72) is positioned within a heated vacuum chuck assembly (74). A pre-cut portion of laminate (14), disposed on a transport tape (40), is then applied to the wafer (72) by a lamination roller (46), which presses the laminate (14) onto the wafer (72). Please note Figs. 1A-B, 2D and 5, and column 5, lines 3-39 of Brady.

Yamamoto teaches that a ring frame (f) is adhered to a section of dicing tape (DT) by an applicator roller (22). A section of the dicing tape (DT) with the ring frame (f) applied to it is then cut away from the roll. This section is moved away by a ring frame lift mechanism (26), which attaches to the ring frame (f) by vacuum. A chuck table (15) carrying a semiconductor wafer (W) is then aligned within the ring frame lift mechanism (26) and another applicator roller (28) moves within the interior perimeter of the ring frame (f) and ring frame lift mechanism (26) to apply the dicing tape (DT) to a surface of the wafer (W) so as to form a mount frame (MF) for the wafer (W). Please note Figs. 1 and 6-15 and paragraphs [0119]-[0165] appearing on pages 5-8 of the Yamamoto application.

Saito teaches an apparatus for applying a protecting film to a semiconductor wafer wherein a press roller (107) is used to apply the protective film (109) to the wafer (W) disposed on a mounting table (201). The mounting table (201) is movable to align the position of the wafer (W) with respect to the press roller (107) and the rest of the apparatus. Please note Figs. 1-8 and column 3, line 1 to column 7, line 28 of Saito.

Applicant submits that Brady, Yamamoto and Saito, taken separately or in combination, fail to teach or suggest the above-mentioned claimed subject matter of claim 8.

Brady teaches an apparatus for sticking a dry photo resist film to a semiconductor wafer. As such, the apparatus taught by Brady is used before circuits are formed on the surface of a semiconductor wafer. As acknowledged by the Office Action, Brady does not teach or suggest a frame member surrounding the wafer-mounting surface of the mounting table.

Yamamoto is cited for the teaching of a ring frame (f), which, according to the Office Action, corresponds to the claimed frame member. Applicant respectfully disagrees. The ring frame (f) taught by Yamamoto is a jig that is not built into the apparatus of the chuck table (15) of Yamamoto but is instead integrated with a wafer (W) through a dicing tape (DT), which together define a mount frame (MF). Please note FIGS. 6-15 and paragraph [0164] appearing on page 8 of Yamamoto. Yamamoto, therefore, does not teach or suggest an apparatus including a frame member, as is claimed in claim 8, since the ring frame (f) forms no part of the apparatus itself, but is instead a component of the mount frame (MF) applied by the apparatus. Accordingly, even if one having ordinary skill in the art were to modify the apparatus taught by Brady according to the teachings of Yamamoto as suggested by the Office Action, the claimed invention would still not be achieved.

Also, the apparatus taught by Yamamoto referred to in the Office Action is an applying unit for applying dicing tape (DT) to a wafer (W) to which protective tape (PT) has already been applied. As such, the applying unit taught by Yamamoto fulfills a completely different role than the claimed sticking apparatus and further does not apply a protective tape or reduce the residual stress in the wafer, as is claimed in claim 8, and therefore does not provide one of ordinary skill in the art with the reasonable expectation that the applying unit for applying ring frames (f) taught by Yamamoto could successfully be incorporated into the apparatus taught by Brady to achieve the claimed invention. For the foregoing reasons, Applicant submits that Yoshinaga does not reasonably suggest a modification to the apparatus taught by Brady that achieves the claimed invention.

Saito is cited for the teaching of an alignment mechanism to align a mounting table with an application mechanism. Saito does not teach or suggest an apparatus that applies a

protective tape to the surface of a semiconductor wafer to protect a circuit formed thereon or a frame member surrounding the adherend-mounting surface of the mounting table, as is claimed in claim 8. Rather, Saito, like Brady, relates to an apparatus for applying protective laminates and films to a wafer prior to imprinting of a circuit onto a surface of the wafer and subsequent back-grinding of the wafer. Saito, therefore, fails to fairly suggest a modification to the apparatus according to the combined teachings of Brady and Yamamoto that achieves the claimed invention.

Applicant submits that claim 8 is allowable for at least the foregoing reasons, as the teachings of the prior art of record, including Yamamoto and Saito, are not sufficient to overcome the deficiencies in the teachings of Brady with respect to claim 8.


Claims 9-11, 22 and 23 are dependent upon and add further limitations to independent claim 8, and are allowable for at least the same reasons discussed above in connection with claim 8.

Further, with respect to dependent claim 9, the claim recites that the fixing roll releases the support film from the protective tape. Applicant submits that the applicator roller (22) taught by Yamamoto and identified in the Office Action as corresponding to the claimed fixing roll does not fulfill this function. Accordingly, Applicant submits that claim 9 is allowable for this reason as well.

Conclusion:

For the foregoing reasons, the Examiner's reconsideration and favorable action regarding claims 8-11, 22, and 23 are respectfully requested.

Respectfully submitted,
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